

**Iliac Endofibrosis In Elite Cyclists: What Are Its Symptoms Despite Normal Pulses: Diagnosis Is Difficult: Diagnostic Workup: Surgical Treatment And Prognosis**

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  - Not related to this presentation



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**Case Presentation**

- 41 yo F, long-distance cyclist (25+ years) and runner
- 7 mo hx right leg complaints
    - Coldness, numbness after intense activity
    - Progressive course
    - No symptoms at rest
  - Workup:
    - ABI in R leg: 1.15 → 0.27 after exercise
    - L leg: 1.3 → 0.88 after exercise
    - CT angiogram: 50% narrowing of R external iliac



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The screenshot shows a blog post with the following text:

**External Iliac Arterioathy in Cyclists**  
External iliac arterioathy is quite a mouthful, some elite cyclists I happened to learn about diagnosed.

Exhaust cycling at a high intensity really damages more and more elite cyclists, speed skaters as damage to the arteries of the pelvic groin and causes the athlete to have decreased blood flow when in the affected leg which causes pain, weakness, and powerlessness during events about this once unheard of athlete injury.

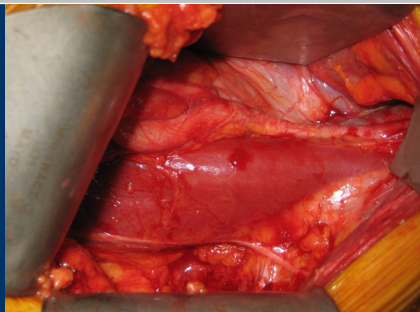
Just this past week I met with [Dr. Cornelius O'Leary](#) and [Dr. Jason Lee](#) two highly regarded vascular surgeons at Stanford [University School of Medicine](#).

They told me that because the exact cause of this condition is not known, it's hard to say if it would go away over time if I stop activity, although it appears unlikely. They also don't know the long-term outcomes of the surgery because there just isn't enough data to say that it will prevent this from coming back. They expect that I would have a good outcome and an even better outcome if after surgery, I modify my activity, their athletes get back to top form after surgery and are fine for years and some have a return of the symptoms after a year or less.

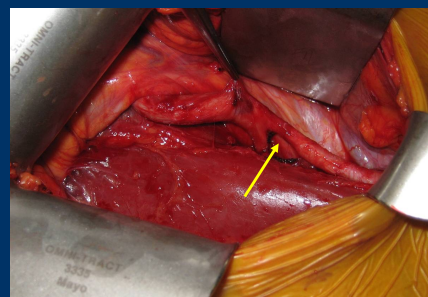
At Stanford, I had some more imaging studies (a [CT Angiogram](#), an [Arterial Brachial Index](#) and another [musculoskeletal](#)) after reviewing the results and a lot of discussion, I've decided to have surgery to repair the artery. I'm going to have surgery and then to modify my activity slightly to hopefully avoid a return of the problem. For me, being a sedentary



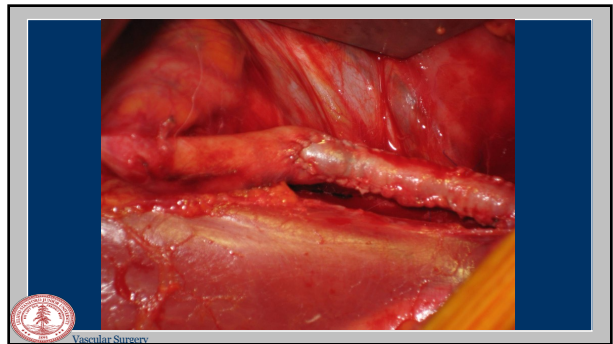
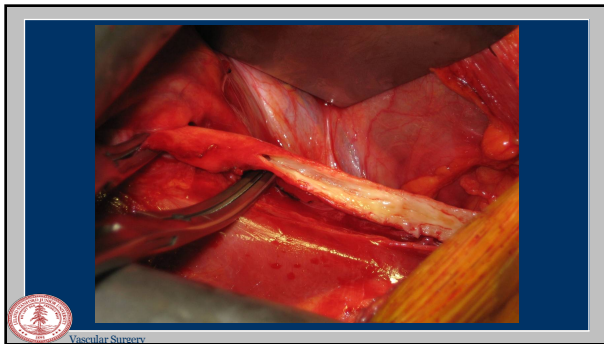
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### What is EIA endofibrosis?

- 1986: Chevalier *et al* (Annals Vasc Surg)
  - 7 patients p/w intermittent claudication
  - ABI decreased, symptoms + after exercise
  - Arteriography: stenosis of iliac artery
  - Rx: endarterectomy, shortening of artery
- 1990: Rousselet *et al* (Hum Pathol)
  - 23 cyclists, same symptoms and test results
  - Pathology: stenotic intimal thickening

### Epidemiology

- Most commonly associated with cyclists
  - Most cycle 8000-30000 km/year
    - Avg 150,000 km
  - Avg age at onset of sx: 25
  - Avg age started cycling: 17
  - M>F
  - Avg time sx → dx: 3 years
- Also seen in speed-skaters, runners, soccer players

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### E.J. Wylie Traveling Fellows

<p><b>2011-2012</b> Rishi A. Chhab, MD University of Pittsburgh School of Medicine Pittsburgh, Pennsylvania</p> <p><b>2010-2011</b> Shawn L. Liu, MD Stanford University Medical Center Stanford, California</p> <p><b>2009-2010</b> Todd R. Siegel, MD, MPH UMDNJ-Robert Wood Johnson Medical School New Brunswick, New Jersey</p> <p><b>2008-2009</b> Erica L. Mitchell, MD Oregon Health &amp; Science University Portland, Oregon</p> <p><b>2007-2008</b> Luis R. Leoa, Jr., MD, RVT University of Arizona Tucson, Arizona</p> <p><b>2006-2007</b> Joseph J. Diglio, MD University of Cincinnati Medical Center Cincinnati, Ohio</p>	<p><b>2005-2006</b> Mark R. Eklund, MD Northwestern University Feinberg School of Medicine Chicago, Illinois</p> <p><b>2004-2005</b> David C. Cassada, MD University of Tennessee Medical Center at Knoxville Knoxville, Tennessee</p> <p><b>2003-2004</b> Jon S. Matsumura, MD Northwestern University Feinberg School of Medicine Chicago, Illinois</p> <p><b>2002-2003</b> Alan Danik, MD, PhD Yale University School of Medicine New Haven, Connecticut</p> <p><b>2001-2002</b> C. Keith Ozaki, MD University of Florida College of Medicine Gainesville, Florida</p> <p><b>2000-2001</b> Ronald L. Dalman, MD Stanford University School of Medicine Stanford, California</p>
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### Pressure measurements at rest and after heavy exercise to detect moderate arterial lesions in athletes

Pierre Abraham, MD, PhD; Sandrine Bickel, MD; Bruce Vlade, MD, PhD; Jean-michel Chevalier, MD, PhD; and Jean-louis Serruys, MD, PhD; *Agilent and Lenox Hill, France*

**pABI of 0.66 @ 1 min**

**90% sensitivity**


**87% specificity**

**Operative Results of Iliac Artery Endofibrosis in High-Performance Athletes**  
 Tiffany Wu, MD, Cornelius Okoro IV, MD, Jason T. Lee, MD, Stanford University, Stanford, Calif.

**Objective:** Prior reports have documented excellent early results after surgery for external iliac endofibrosis in cyclists. We sought to evaluate our long-term functional outcomes in this select cohort of patients.

**Methods:** Patients undergoing reconstruction for symptomatic iliac artery endofibrosis at a single institution from 2000 to 2015 were reviewed. With Institutional Review Board approval, data were collected from medical record review and follow-up telephone interviews.

**Results:** Eighteen patients (mean age, 44 years; range, 26-57 years; 8

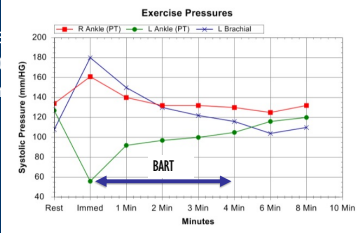


- Single institution, retrospective review 2000-2015
- Symptoms
  - Loss of power (n=16, 89%)
  - Leg weakness or fatigue (n=16, 89%)
  - Resolution of symptoms at rest (n=16, 89%)
- Non-invasive imaging
  - Normal resting ABIs (n=15, 83%)
  - Abnormal exercise ABIs (n=15, 100%)

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**Workup: exercise ABIs**

• Positive  
 – ABI  $\leq 0.9$   
 – Return to rest

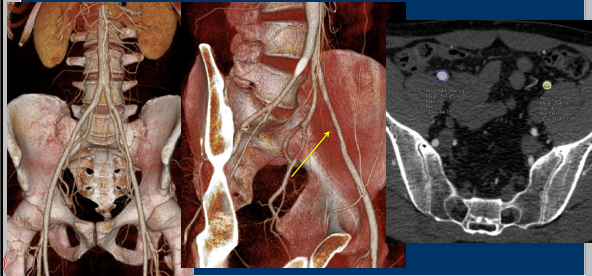


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 Sorondo MD<sup>1</sup> and

external iliac artery endofibrosis. We evaluated a (BART) in a cohort of cyclists with symptomatic endofibrosis for the ankle-brachial index (ABI) and exercise ABI (EABI) at rest and during exercise. Documentation of the BART's retrospective hemodynamic improvement. (3)

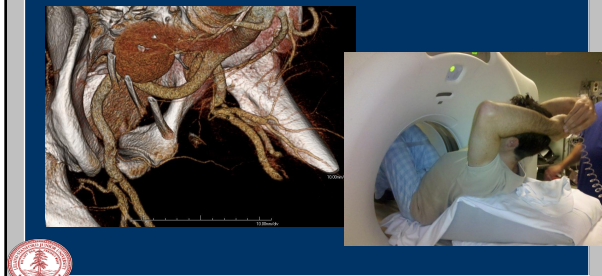
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**Workup: CT-A**



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**Workup: positional CT-A**



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**Results**




	1 Year	Latest Follow Up (mean: 72 months)
Overall	17 (84%)	15 (83%)
Patch Angioplasty (n=9)	9	9
Shortening (n=4)	4	3
Bypass (n=5)	4	3
Inguinal Ligament Release (n=13)	13	13
Occluded at Presentation (n=3)	2	0

Activity level	(n=18)
Return to prior elite performance level	56%
Return to "high" performance level	89%
Currently active (6 year follow-up)	89%
Currently active in same sport	78%
Currently competing	33%
Currently symptom free	56%

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• Imaging understanding

- Psoas hypertrophy
- Arterial lengthening
- kinking

**Anatomic Factors Contributing to External Iliac Artery Endofibrosis in High-Performance Athletes**  
 Andrew J. Zoller, Kenneth Tsai, Steven J. Dworkin, Jaber Srivastava, Arash Farahmand, and Jason T. Lee, Stanford, California

**Background:** External iliac artery endofibrosis (EIAE) classically presents in cyclists with chronic narrowing of the distal aorta. We investigated possible anatomical predisposing factors including psoas hypertrophy, iliac tortuosity, inguinal ligament compression, and arterial kinking via a case-control comparison of symptomatic and contralateral limbs.

By the inguinal ligament have not been previously described, we created this measure because inguinal ligament release is an accepted operative technique for EIAE. Arterial tortuosity was quantified using tortuosity index as central curve/radius distance divided by straight line distance (referred to "the Tortuosity Index") in the Tortuosity Index (EVAR package, Aquarius Software, Terebren Inc., San Mateo, CA). We chose the distance ratio tortuosity index over a tortuosity index measure since Sharp et al. had previously found a higher distance-ratio tortuosity index among EIAE patients compared with control athletes. Tortuosity was measured for the distal arterial segments and the same segments on the contralateral side, using

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## Conclusions

- Work-up should include bike exercise ABIs and positional CTA
- Surgical treatment results in durable patency in patients presenting without occlusion
  - Patch angioplasty vs replacement of area of luminal narrowing with inguinal ligament release
- 89% able to return to high level of cycling
  - Nearly half truly compete at prior peak cycling performance
  - 6 year results in long-term follow-up
  - Confirmed in other experienced US centers



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